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it. For the week ended February 24 it corresponded to an annual rate of 26.25 a thousand, the greatest increase being in the diseases of the respiratory organs.

In accordance with authority granted, I visited Bremen February 26 to see the methods used there in carrying out the provisions of our quarantine regulations, and found the inspection at Bremen to be more complete than at Hamburg.

Respectfully, A. C. SMITH,
Passed Assistant Surgeon, U. S. M. H. S.

The SURGEON-GENERAL,
U. S. Marine-Hospital Service.

Methods of disinfection used in Hamburg.

HAMBURG, GERMANY, *March 8, 1900.*

SIR: As directed in Bureau letter (F. L. G., R. M. W.) of the 5th ultimo, I have the honor to report upon the theories and methods of disinfection as practiced at Hamburg in public sanitation.

In a former letter I mentioned the fact that somewhat different theories prevailed here from those on which the practice at United States quarantine stations is based. These differences may be briefly stated as two—the rejection of gases altogether as disinfectants and the use of a simpler method and less elaborate apparatus in steam disinfection.

The disinfection establishment, which is the headquarters of this work and is under the police authority, is situated in an outlying part of the city, and consists of a roomy brick building and smaller outbuildings in a walled inclosure. Here are the steam disinfecting apparatus and supplies of materials and apparatus for house disinfection, and from here are sent wagons and men to do house disinfecting. One of the many canals or offsets of the Elbe also reaches the establishment; and when disinfection is required on board any vessel lying in the harbor, men are sent from here to do the work and boats or barges are used for bringing away articles requiring steam disinfection.

The steam chambers are 5 in number, and are set in a brick wall, one end opening in a large room on the unclean side and the other in a similar room on the clean side. There is no communicating door between the 2 sides, and workmen never pass from one to the other and only speak through a telephone. Each chamber has a capacity of 5 cubic meters, and is an oval cyclinder, 2.5 meters long by 2.5 high and 1.8 broad, opening at each end. The cylinder has no jacket nor coil, but a large radiator, or heater, lies the full length of the bottom. The pipes for admitting steam lie just over this radiator, in the bottom, and also extend along the top. A ventilating pipe enters at the very bottom, from the clean side, so that when air is admitted for ventilation it passes around the hot radiator. The escape pipes for air and steam are in the top. The walls of the chamber are of steel, 5 millimeters thick, and are covered on the outside with a heat-insulating material. The thermometer and pressure gauge are at the unclean end and the apparatus is controlled from that end. There is no apparatus for producing a vacuum and the walls of the chamber would not be stiff enough to support it.

The rack for holding articles for disinfection is in 4 tiers and the frame fills the chamber above the heater, running on a track which lies immediately over the heater and is continued at each end by movable pieces on the outside. The articles to be disinfected are not hung up, but are laid on the tiers. The whole apparatus is conspicuous for its lightness in comparison with those used among us.

In using the steam chamber, dry heat is applied in the beginning only in the case of thick articles such as beds, blankets, and carpets, when the heat is carried to about 70° C. before steam is admitted. Otherwise steam is admitted at the start. The steam heat is carried up to 102°-104° C. and the process is continued at this temperature for from fifteen minutes to one hour, the length of time for which it is continued depending upon the thickness of the materials to be disinfected and the time required to secure penetration of the steam.

The distinctive feature of the method is the use of "flowing steam" (strömender Dampf), instead of the vacuum, to drive out the air and secure penetration. This is done by allowing a constant escape of steam through 2 small holes about the size of a lead pencil, steam being at the same time admitted in sufficient quantity to maintain a slight pressure, the rule being $\frac{3}{20}$ of an atmosphere pressure. The radiator in the bottom of the chamber is also used to help in maintaining the necessary temperature.

In the case of heavy or thick articles, after the flow of steam is cut off, at the termination of disinfection, ventilation with air through the openings before described is made use of, and is continued for from ten to twenty minutss while the articles are still in the chamber subject to the heat of the radiator. In the case of very light articles no measures for drying are found necessary.

For testing the penetration of heat into the interior of articles an electrical apparatus is used, having a small metal ball, wrapped within the article to which the test is applied, containing a piece of alloy which requires a temperature of 102° C. continued for fifteen minutes to melt. The melting of the alloy causes the completion of an electrical circuit and the ringing of a bell outside the steam chamber. This test is frequently made, and once in every four weeks the effectiveness of the apparatus is tested with actual cultures of disease germs.

The inspector of the disinfecting establishment is not a physician, and the technical experiments connected with the work are made under the direction of Professor Dunbar, director of the Hygienic Institute at Hamburg. I have talked with Professor Dunbar on the method of steam disinfection, and he states that he has found by tests made that he obtains practically as good results with the "flowing steam" method as with the vacuum method, while the apparatus is much simpler and less expensive. His experiments are open to criticism, however, on account of the kind of vacuum apparatus used in his tests. The vacuum was not produced by exhausting the air from the warm chamber, but by first driving out the air with steam and then condensing the steam with a spray of cold water, after which fresh steam was admitted for disinfecting. Even granting that this is a good method of producing negative pressure under other circumstances, it has the great disadvantage here of cooling the apparatus and contents and residue of air and causing a deposit of cool vapor on all contained articles and surfaces; and the first energy of the newly applied steam must be exhausted in revolatilizing this cool vapor, and the penetration of the steam must be retarded by the condensed vapor in the first layers of the clothing at the same time that the reheating of the clothing is rendered slow. I do not think, therefore, that this constitutes a test of the comparative value of the vacuum method as used in our apparatus. Professor Dunbar states that he has found an advantage in rapidity of penetration by superheating confined steam after the use of the vacuum, but that it is more dangerous to fabrics than the method of disinfection by flowing steam.

In regard to the use of dry gases as disinfectants, Professor Dunbar considers that the worthlessness of sulphur dioxide was so clearly established years ago that it was useless to experiment further with it. He has found formaldehyd entirely unreliable, but I do not understand that all experiments with it have been abandoned.

This rejection of sulphur dioxide and formaldehyd makes the method of house disinfection different from our practice. The room is prepared by first removing all fabrics for disinfection, wash linen being submerged in 5 per cent carbolized solution, clothing, beds, carpets, and hangings being sent to the steam chambers, and rubber, leather, and fur goods being disinfected with carbolized solution as to be hereafter described. All movable furniture is put into the center of the room and covered. The room is swept and the floor, walls, and ceiling are scrubbed with water and kresol soap. The walls and ceiling are then rubbed down with bread, after which walls, ceiling, and floor are sprinkled with 2 per cent carbolized solution, a large soft brush being used for this.

Furs are disinfected by cleaning with a dry brush and sprinkling with 5 per cent carbolized solution. Leather and rubber goods are washed with soap and water and then wiped or sprinkled with 5 per cent carbolized solution. The furniture in the room is treated like the floor; it is cleaned and scrubbed and sprinkled with 2 per cent carbolized solution. This completes the disinfection of the room.

A carriage in which a person sick with contagious disease has been moved is cleaned thoroughly inside and then sprinkled with 1–1000 bichloride solution.

Ship disinfection, as done in the harbor, is carried out on exactly the same lines as house disinfection, namely, steaming of beds and fabrics, and mechanical cleansing of the closed spaces, followed by sprinkling with carbolized solution. In the hold 5 per cent carbolized solution is used, and for the bilges a strong solution, or mixture, of chlorinated lime, which is left standing in the bilges for a time. Cargo in the hold is treated, so far as conditions permit, in the same manner as furniture in a room. I will delay making a particular description of ship disinfection until I have had a chance to visit the quarantine station at Cuxhaven, which is the maritime quarantine for Hamburg.

German system and thoroughness are admirably shown in the carrying out of the details of disinfection. Different sets of wagons and laborers handle goods before and after disinfection. All laborers engaged in handling unclean goods and in house disinfection wear special overgarments and moist sponges over mouth and nose. At the termination of a piece of work or before leaving the disinfection establishment at night they bathe in specially provided bathrooms and have clothing disinfected. The kit for house disinfection is carried in a galvanized iron box and is very complete, comprising 64 pieces. A store of tools and all supplies used in disinfecting is kept on hand, and also the uniform garments for 400 employees in case so many should be needed in any emergency such as an epidemic.

There are special apartments at the disinfection establishment where every midwife who has been in contact with any case of contagious disease is required to come and undergo cleansing and have clothing and instruments disinfected.

For the disinfection of the dejecta in cases of disease such as enteric fever chlorinated lime is used, a spoonful being mixed with a single stool and left standing two hours before throwing out.

From the foregoing report it will be seen that the tendency in disinfection here is to simplify methods and to decrease the number of disinfectants rather than to increase them, rejecting everything which is not to be absolutely trusted. My own conclusions are that the German steam chambers are not equal to our own, though the argument in favor of a simple and inexpensive apparatus is good; and that in the method of house disinfection, the mechanical cleansing and ventilation which must naturally follow, are of more value than the sprinkling with carbolized solution. The point made against the use of sulphur dioxide and of formaldehyd is of extreme importance and demands our attention.

Respectfully,
A. C. SMITH,
Passed Assistant Surgeon, U. S. M. H. S.

The SURGEON-GENERAL,
U. S. Marine-Hospital Service.

HAWAIIAN ISLANDS.

Visit to Kahului and Hilo—Precautions in the shipment of sugar.

HONOLULU, H. I., *February 20, 1900.*

SIR: I have the honor to inform you that on Tuesday evening, February 13, at 10 o'clock, Dr. Carmichael and I, accompanied by Dr. Wood, the president of the Hawaiian board of health, left for Kahului and Hilo on board the U. S. S. *Iroquois.*

We arrived at Kahului the next morning, and gave directions what precautions should be taken with the sugar which was to be shipped from there. All the buildings which might have been infected were burned. The vessels lie out in the stream and have no communication with the shore. The wharf was washed down with a solution of sulphuric acid. A fence was erected at the entrance and a guard placed there to prevent any one going on. All sugar in the warehouses at the time of the breaking out of the disease wili not be shipped for the present. It will be thoroughly fumigated first.

The sugar now being shipped comes directly from the plantations, some 5 miles away, by railway. The cars are washed with disinfectants and run directly out on the wharf and lightered out to the vessels. The men handling the sugar are quarantined. There have been no new cases since the first reported. All the people who lived in the burned houses have been isolated, and will be kept so until all danger is over. Should it break out again we have arranged that the sugar will go to Kehei for shipment. The plantations agreed to lay tracks to the place.

We left Kahului that afternoon and arrived at Hilo the next morning. Dr. Carmichael was delighted with the way sugar is shipped. None of it, with the exception of the product of 1 mill, touches Hilo. The vessels lie in the open bay with no communication with the city. The sugar is shipped directly from the plantations by water, either in small steamers or in lighters to the vessels in the bay. One plantation has its mill in the city and hauls its sugar in wagons through the streets to the water front. We have for the present prohibited this sugar being shipped until time shows whether plague really exists or not at Hilo, there being some doubt. We left that night, reaching Honolulu the next morning. The trip was made in a storm which necessitated Captain Pond being constantly on duty for three days.